

**BIOLOGICAL OBSERVATIONS ON THE MUD-DAUBER WASP
SCELIPHRON FORMOSUM (F. SMITH) (HYMENOPTERA: SPHECIDAE)**

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Abstract

Observations were made on the nesting biology of the mud-dauber wasp *Sceliphron formosum* (F. Smith). The nest, mud collection, cell construction and provisioning are described. Cells were provisioned almost exclusively with spiders of the family Salticidae.

Introduction

The cosmopolitan wasp genus *Sceliphron* Klug is represented in Australia by the endemic *S. laetum* (F. Smith) and *S. formosum* (F. Smith), and by the North American *S. caementarium* (Drury), established only in the Brisbane area. Naumann (1983) gave an account of the biology of *S. laetum*, with a key to *Sceliphron* and maps of distribution in Australia, and Smith (1979) discussed population dynamics.

S. formosum was assigned by van der Vecht and van Breugal (1968) to the subgenus *Prosceliphron*, which contains about a dozen species, restricted to the Old World. Little is known of the biology of this subgenus. Bohart and Menke (1976) listed *S. formosum* from Australia, Papua New Guinea and Indonesia (Ceram and Ternate). In Australia it is less widespread and rarer than *S. laetum*, reaching as far south as Canberra, Australian Capital Territory.

In the tropical part of its range *S. formosum* nests no doubt throughout the year. In Canberra, where it nests only during the summer, I have observed females collecting mud and building a nest, on which the following account of nesting biology is based.

Nest

(Fig. 1)

The nest of *S. formosum* when first observed on 29 December 1984 comprised a row of 4 contiguous mud cells, 3 sealed and provisioned and one built, but left open and empty. This cell was stored and closed on the following day. On 31 December a fifth cell was constructed and next day provisioned and sealed. The site of the nest was at a height of 1.5 m on a wall inside the garage of my house in Canberra. The door was left open during the day and the nest was well illuminated by sunlight entering through a nearby window.

The completed nest of 5 cells was 52 mm long and 35 mm wide. It was not covered by an extra layer of mud (crepissage) applied after completion of the cells. Individual cells were 32-35 mm long and 9-10 mm wide. Each cell was amphora-shaped with a smooth external surface and its own entrance, 5.5 mm in diameter, which was sealed by the female on completion of provisioning. The wasp had changed the mud source during nest construction,

as the first 3 cells were grey in colour and the others reddish brown. Naumann (1983) figured a 3-celled nest, from which adult wasps had emerged, on the wall of a house at Jabiru, Northern Territory.

Mud collection

Females of *S. formosum* were observed collecting mud in hot, sunny weather between 1400 and 1500 hr on 15 March 1981 and 23 December 1982 from a wet mud patch in my garden. The mud was a bare area of soil on the edge of the lawn deliberately kept moist by watering, and attracted various mud-building aculeate wasps. The female formed the mud into a pellet, about 2 mm in diameter, using the forelegs and mandibles. Mud collection required about 60 sec., and was accompanied by a high-pitched buzzing, which was also emitted when pellets were deposited in cell construction. The mud pellet was held by the mandibles during flight to the nest site. Although an attempt was made to follow the flight path of females, nests were not discovered at this time.

Cell construction

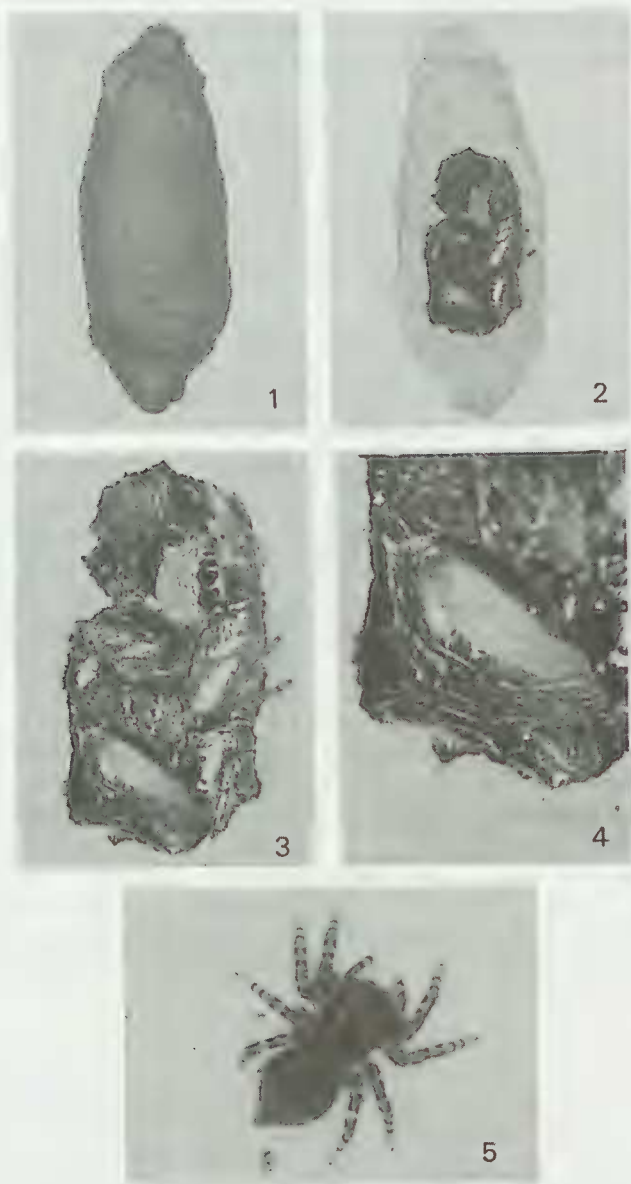
The construction of a cell was observed on 31 December 1984. Building extended from about 1330 to 1530 hr, taking some 2 hr to complete the cell, which was left open overnight. During the last hour of construction 15 mud-carrying flights were observed, suggesting that about 30 mud pellets were required to build the cell. The mud source was not located, but was doubtless nearby, as only a short time was spent in gathering mud and carrying it to the nest.

An average of 45 sec. (range 40-60 sec.) was spent daubing mud on the cell, and 120 sec. (range 60-180 sec.) collecting mud and transporting it to the cell, giving an average pellet cycle of 165 sec. The high-pitched buzzing emitted by *S. formosum* when depositing mud-pellets was not as loud as that produced by *S. laetum*.

During cell construction the female left the nest once for 6 min. and on another occasion for 14 min., but both those absences have not been included in the average time for collecting and carrying mud to the cell. During these longer periods the female probably visited flowers to feed on nectar or may have been basking.

Provisioning (Figs 2-4)

Cells were provisioned with spiders, and storing the cell built on the previous day was observed on 1 January 1985. Provisioning commenced before 1200 hr and was completed by 1400 hr. The female oviposited on the first spider placed within the cell. Oviposition was not observed, but must have occurred before 12 noon. After depositing the spider, the female laid the egg, 2.8 mm in length, attached to the ventral surface of



Figs 1-5. *Sceliphron formosum* (1) sealed mud cell, 33 mm long and 9 mm wide; (2) cell removed from wall with stored spider prey; (3) salticid spider prey with egg on first spider stored; (4) egg, 2.8 mm long and 0.8 mm wide, attached to opisthosoma of prey; (5) salticid spider prey. [Photos by J. P. Green].

the opisthosoma. Subsequently, spiders were collected and stored one by one until the cell was filled.

Hunting flights averaged 175 sec. (range 120-300 sec.). The female spent about 60 sec. (range 45-120 sec.) in the cell from returning with prey to starting on the nest hunting flight. This gave an average provisioning cycle of 235 sec., and suggested the exploitation of a ready source of prey nearby. As 18 spiders were stored in the cell, there must have been as many provisioning flights. The female occasionally spent longer periods away from the cell, possibly experiencing difficulty in finding prey or the time may have been spent in feeding or basking.

Final closure of the fully provisioned cell with a thick plug required 3 mud pellets and took about 30 min. Temporary cell closure with a thin mud plug has been observed in Canberra in *S. laetum*, when, with the onset of darkness, provisioning was not completed. This was not observed in *S. formosum*, but occurs no doubt under the same conditions.

Prey

(Fig. 5)

In all 80 spiders were removed from the 5 cells in the nest, 12-20 spiders being stored per cell. The pooled spiders comprised 74 Salticidae, 4 Miturgidae (*Miturga* sp.), 1 Araneidae (*Araneus* sp.) and 1 Heteropodidae (*Isopoda* sp.). The Salticidae included both adults and juveniles and were represented by 3 species. The predominant prey comprised 63 sp. A, probably *Saitis taeniatus* Keyserling. Other salticid prey were 6 sp. B and 5 sp. C of indeterminate genera. The non-salticid prey were juveniles, identifiable to genera but not to species.

No observations were made of *S. formosum* actually capturing prey. Hunting evidently took place near the nest site, the salticid identified provisionally as *taeniatus* being found abundantly on the walls of my house.

Discussion

Naumann (1983) reported nests of *S. formosum*, protected from rain but well illuminated, on the walls of houses at Jabiru, Northern Territory. The *S. formosum* nest in Canberra was also in a sheltered, well illuminated situation. By contrast, nests of *S. laetum* are usually found in shaded or dimly lit sites protected from direct sunlight. These nests have been built several times in the same Canberra garage as contained the *S. formosum* nest, but invariably in a poorly illuminated situation in the angle between wall and ceiling. The nest structure of *S. formosum* in Canberra was similar to that described by Naumann (1983). Unlike nests of *S. laetum* and related species, *S. formosum* nests are not covered with an extra layer of mud.

Nesting behaviour in *Sceliphron* comprises the pellet cycle, starting with flight from the nest and ending after adding the collected mud pellet to the cell, and the provisioning cycle starting similarly and ending with the collected prey being deposited in the cell. In *S. formosum* the pellet cycle was

2.75 min. Freeman and Johnston (1978) reported for *S. assimile* Dahlbom a longer and Naumann (1983) for *S. laetum* a shorter pellet cycle, the distance of the mud source from the nest accounting no doubt for the variation. In *S. formosum* the provisioning cycle was about 4 min., much shorter than that reported in *S. assimile* and *S. laetum* (> 9 min.). This undoubtedly reflected the ready source of prey (Salticidae) available on nearby walls for *S. formosum*, and the greater difficulty in finding prey (Araneidae) for the other species.

The prey of *S. formosum* comprised almost exclusively spiders of the family Salticidae. Much the most abundant species was provisionally identified as *Saitis taeniatius*, which occurs commonly on the walls of my house. By contrast, the prey of *S. laetum* and its allies consists mainly of Araneidae, but may occasionally include spiders of several other families. In over 100 records of prey from *S. laetum* nests built in my garage all spiders were Araneidae, predominantly *Eriophora biapicata* (L. Koch), *Araneus heroine* (L. Koch) and *A. urquharti* (Roewer).

Sceliphron is essentially an opportunist in regard to prey and captures readily available spiders near the nest site. *S. formosum* apparently hunts for Salticidae on walls, while *S. laetum* takes Araneidae on their orb-webs. A marked degree of prey-specificity permits these related wasps to nest in close proximity, each exploiting a different family of spiders without competing for food resources.

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